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Method of operating a sewage system; and such a sewage system

The present invention relates to a method of operating a sewage system in accordance with the preamble of claim 1. The invention further relates to a sewage system in accordance with the preamble of claim 6.

5 In addition to the use of so-called free-fall sewage systems for long-range transport of waste water, use is generally made of sewage systems in which the waste water is transported to the sewage system under pressure by means of sewage pumps, such as plunger pumps disposed in catch  
10 pits.

One feature of these systems is that the waste water only moves in the pressure pipe system when a sewage pump is running. A problem that occurs in this connection is the fact that the waste water to be discharged remains in the  
15 sewage system for a prolonged period of time, which may lead to a low oxygen content of the waste water.

These circumstances lead to bacteriological processes by which  $H_2S$  is formed in the sewage water in the case of prolonged residence times.

20 Said bacteriological processes and the formation of  $H_2S$  may have the following consequences:

- Odour nuisance at the discharge point;
- Damage to sewer lines and pumping-stations in the sewage system:

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- o Accelerated depreciation of the sewage systems;
- o Increased usage of materials and, as a result:

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- Increased energy consumption for exchanging the damaged materials;
- Increased waste flow;

- The purification efficiency of the waste water purification plant may be adversely affected by the low-oxygen water;

- Public health hazard,  $H_2S$  is highly toxic.

The development of the bacteriological process may take place in the following manner. The temperature of the air in the discharge pit directly above the waste water is higher than the temperature close to the concrete wall (influence of the surrounding ground). As a result, a condensation layer is formed on the concrete wall above the water surface, in which the bacteria may occur that live on the energy that is released in the course of the production of sulphuric acid. Said bacteria use sulphur as an energy source, and produce the sulphuric acid. The fact is that in the presence of oxygen in the atmosphere of the discharge pit and free-fall sewers located downstream thereof, hydrogen sulphide gas is not stable and is converted into sulphur. Free form sulphur is also found in decayed concrete, therefore. Various types of bacteria successively develop in the layer of condensation on the concrete wall, which bacteria produce increasingly higher concentrations of sulphuric acid. The final phase in the formation of sulphuric acid is controlled by the so-called "concrete eater". This is a type of bacterium that grows optimally in an environment in which the degree of acidity is very high.

As the degree of acidity increases, the cohesion of the cement-bound material is eventually lost. The various corrosion products may remain behind on the concrete surface in the form of a (white) crust of gypsum and hydroxides of aluminium and iron. Said layer can be recognized by its reddish brown colour at very low concentrations already. The "washed-out gravel" effect and the disintegration of the outer layer of concrete form part of the overall image of concrete decay.

The object of the present invention is to provide a novel method of operating a sewage system as well as a novel sewage system by which the extent to which  $H_2S$  is formed is at least reduced.

To that end, the method according to the invention comprises the aspects defined in the characterising portion of claim 1, and the sewage system according to the invention

comprises the aspects as defined in the characterising portion of claim 6.

According to the invention, the oxygen content of the waste water can be maintained at the required level by using means whose energy consumption can be low on account of the fact that they are used periodically.

Preferably, air is blown into the sewage system by means of an air pump. This is a relatively simple and inexpensive way of introducing oxygen into the waste water.

According to the invention it is possible, for example, to add (ambient air containing) oxygen to the sewage system 1 to 20 times per hour, with the oxygen preferably being added at a location as far away from a discharge point of the sewage system as possible.

If the air blowing parameters are selected in dependence on the sewage system parameters, an optimum gearing of the introduction of oxygen can be achieved.

In the sewage system according to the invention, the air pumps may be disposed in at least a number of the pits, with an air pump being installed in one in 5 to 25 pits, for example.

In most cases this will suffice for introducing sufficient oxygen into the water to prevent the formation of  $H_2S$  to a satisfactory extent.

The invention will be explained in more detail hereinafter with reference to the drawing, which shows an embodiment of the invention.

The only figure of the drawing is a very schematic representation of a sewage system according to the invention.

The drawing very schematically shows a closed sewage system comprising a sewage pipe 1, a number of pits 2 and a discharge point 3. A plunger pump 4 is installed in each of the pits 2, which pump discharges the waste water being collected in the pit as required (a few times a day) by having the pumps run at great intervals so as to forcefully drain the entire sewage pipe.

According to the invention oxygen, in particular in the form of air, is artificially introduced into the sewage pipe

1 at regular intervals so as to prevent bacteriological  
processes from developing. In this way the waste water is  
prevented from becoming poor in oxygen, which might give rise  
to the formation of the harmful  $H_2S$ . Said oxygen is  
5 preferably introduced by means of an air pump or air  
compressor 5 for the like. For example, a number of 4-20 air  
compressors may be provided for every 100 sewage pumps,  
preferably in the pump pits or in separate pits. Said  
compressors can blow air into the downstream pressure line of  
10 the sewage pumps below the surface of the waste water for  
some time, for example 0.5 - 1 minute, with a frequency of,  
for example, once every 5 minutes to once an hour. The  
compressors may have a capacity of a few  $m^3$  per hour. Since  
the air cannot escape from the closed system, it will be  
15 absorbed in the waste water and thus continue to contain  
sufficient oxygen for preventing anaerobic bacteriological  
processes from developing. The sewage pipe will be partially  
drained as a result of air are being forced therein. The  
operation of the compressors (capacity, blowing frequency and  
20 blowing amount, etc) will be selected in dependence on the  
system parameters of the sewage system in question so as to  
obtain the best possible results.

The invention is not limited to the embodiments as  
shown in the drawing and described in the foregoing, which  
25 can be varied in various ways within the scope of the  
invention as defined in the claims. Thus it would be possible  
according to the invention to use the method of introducing  
oxygen in free-fall sewage systems.